BROOKHAVEN NATIONAL LABORATORY

Mission

Advancing nanoscience to impact society

Sponsor

U.S. Department of Energy
Office of Science

State-of-the-Art Facilities

- Electron Microscopy
- X-ray Nanoscience Instruments
- Nanofabrication
- Nanomaterial Synthesis
- Advanced Optical Spectroscopy and Microscopy
- Proximal Probes
- Theory and Computation

CFN User Community

- Over 500 users annually from universities, companies, and government labs around the world
- Annual user meeting with presentations and hands-on technique workshops

Becoming a User

- http://www.bnl.gov/cfn/user
- Free use of facilities for open research after external merit review of proposal
- Accepted user projects are valid for two years
- Facility use for proprietary work subject to fees
- Rapid facility access possible with suitable justification

BROOKHAVEN NATIONAL LABORATORY

Center for Functional Nanomaterials

Center for Functional Nanomaterials

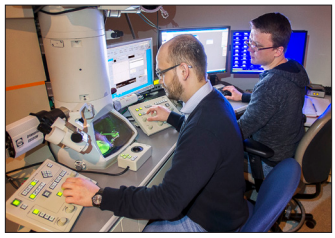
State-of-the-Art Capabilities for Nanoscience

The Center for Functional Nanomaterials (CFN) at Brookhaven National Laboratory is a national scientific user facility, offering users a supported research experience with top-caliber scientists and access to state-of-the-art instrumentation. The CFN mission is advancing nanoscience to impact society, by being an essential resource for the world-wide scientific community and by carrying out transformative basic research that produces breakthroughs in nanomaterials to advance the energy, economic, and national security of the United States.

Three strategic nanoscience themes underlie the CFN advanced scientific facilities: The CFN fosters research on complex self-assembly processes, with the end game of creating new ways of constructing **Self-Assembled Nanomaterials by Design**. The CFN supports state-of-the-art techniques for designing **Nano-Architectures** for improving material performance, particularly that of materials for energy. The CFN develops and provides advanced capabilities for studies of **Nanomaterials in *Operando* Conditions**, with the ability to characterize atomic scale materials and reactions in real-world environments. Continual progress on these themes is driven by a commitment to advance and develop new, sophisticated technical capabilities.

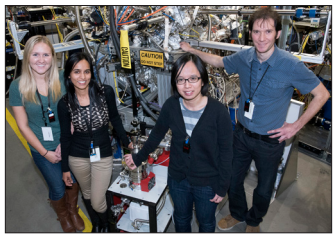
Advanced Facilities for User Nanoscience

Electron Microscopy



- Atomic resolution imaging and spectroscopy with advanced, aberration-corrected electron microscopy
- Real time *in-situ* and *operando* methods for understanding dynamic changes in nanomaterial structure
- Three-dimensional imaging through electron tomography
- Novel methods for imaging soft-matter at atomic resolution

X-ray Nanoscience Instruments

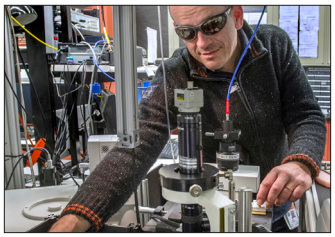


- A suite of high-flux synchrotron beamlines, and complementary lab-based instruments, provide detailed structural and spectroscopic nanomaterial characterization
- High-performance X-ray scattering for nano-and molecular-scale structural characterization, including *in-situ* measurements
- Aberration-corrected low-energy electron microscopy and X-ray photo-emission electron microscopy for nanoscale structural, electronic and chemical surface characterization
- Ambient pressure X-ray photoelectron spectroscopy for *in-situ* studies of surface chemistry

Nanofabrication

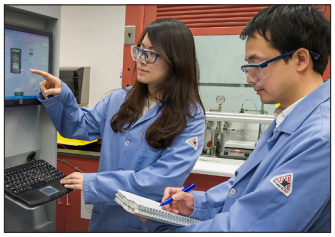
- High-resolution electron-beam lithography
- 3D laser lithography
- Inductively-coupled plasma etch using fluorine and chlorine chemistries
- Thin film synthesis by physical vapor deposition, plasma-enhanced chemical vapor deposition, pulsed laser deposition, and atomic layer deposition

Advanced Optical Spectroscopy and Microscopy



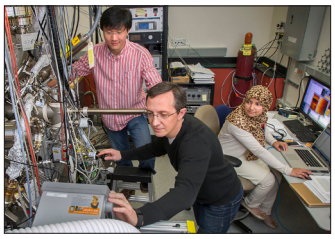
- Advanced ultrafast spectroscopy and microscopy methods, including single-molecule sensitivity
- Nanomaterial characterization by time-resolved absorption, luminescence spectroscopy and imaging
- *Operando* experiments, including variable temperature and magnetic fields, and photocurrent microscopy
- Advanced data analysis methods, adaptable to individual nanomaterials

Nanomaterial Synthesis and Characterization



- Synthesis and characterization of inorganic nanomaterials, including quantum dots and shaped metallic nanoparticles
- Fabrication of complex nanostructures by self-assembly: DNA-guided superlattices and mesostructures, and multi-layered block copolymer nanostructures
- Conversion of organic nanophases into inorganic replicas
- Variable-temperature electrical characterization

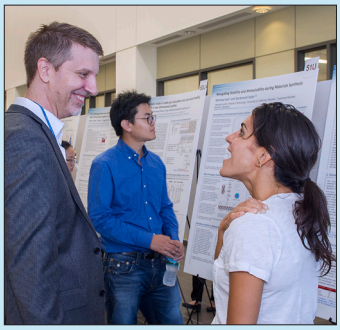
Proximal Probes



- Elevated-pressure and flow-reactor scanning probe microscopy
- Atomic-resolution, real-time, and spectroscopic surface microscopy of dynamic surface processes
- Non-contact atomic force microscopy with inter and intra-molecular resolution

Theory, Data Analytics and Computation

- Theory and simulation of structure-property relationships, both from atomic-scale and coarse grained, and engaging self-assembled materials, nanostructured materials for energy and processes observed operando
- Diverse software packages including those for quantum chemistry, electronic structure of materials, molecular dynamics and photonics supported by a high-performance computing facility
- Data analytics for specific facilities supported by integrated data storage and computing



Convenient Location

- Located 60 miles east of New York City
- Proximity to three major airports and Amtrak
- On-site housing for visiting researchers

Contact Information

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